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LIQUID FUEL ADAPTED FOR DIFFERENT COMBUSTION SYSTEMS
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PATENT APPLICATION CLAIMS /5*

1. A type of high caloric value, high volatility, low pollution, and low cost liquid fuel adapted for different types of combustion systems, characterized by said liquid fuel is basically produced by dissolving heavy oil in raw pentane. Of which, the proportion varies by different types of combustion systems. Its proportional range is as follows:

Raw pentane	90-10%
Heavy oil	10-90%

2. A type of high caloric value, high volatility, low pollution, and low cost liquid fuel adapted for different types of combustion systems, as described in Claim 1, of which said fuel formed by raw pentane and heavy oil. Various proportions are adaptable to various types of combustion systems.

	Raw Pentane	Heavy Oil
Gasification burner	80%	20%
Oil hydraulic injection burner	50%	50%
Reverse burner	30%	70%

3. A type of high caloric value, high volatility, low pollution, and low cost liquid fuel adapted for different types of combustion systems, as described in Claim 1, of which the raw pentane can be partly or fully substituted by high volatility, low octane number alkanes using a boiling point range between 60°C to 150°C.

4. A type of high caloric value, high volatility, low pollution, and low cost liquid fuel adapted for different types of combustion systems,

* Number in the margin indicates pagination in the foreign text

as described in Claim 3, of which the low octane number alkanes using a boiling point range between 60°C to 150°C include n-hexane, n-heptane, n-octane, and n-nonane.

5. A type of high caloric value, high volatility, low pollution, and low cost liquid fuel adapted for different types of combustion systems, as described in any of the aforementioned Claims, where heavy oil is dissolved in raw pentane, blended with high centane alkanes ideal for high-, medium-, and low-speed diesel engines, replacing diesel liquid fuel. /6

6. A type of high caloric value, high volatility, low pollution, and low cost liquid fuel adapted for different types of combustion systems, as described in Claim 5, of which said high cetane alkanes include a boiling point range between 60°C to 150°C n-hexane, n-heptane, n-octane, and n-nonane. It contains various cetane numbers, ideal for the three fuel mixtures for high-, medium-, and low-speed diesel engines, as shown:

(1) Suitable for high-speed diesel engines:

n-hexane	10%
n-heptane	20%
n-octane	60%
heavy oil	10%

(2) Suitable for medium-speed diesel engines:

Raw pentane	10%
n-hexane	10%
n-heptane	20%
n-octane	40%

heavy oil 25%

(3) Suitable for low-speed diesel engines:

Raw pentane 20%

n-hexane 10%

n-heptane 10%

n-octane 20%

heavy oil 40%

7. A of type high caloric value, high volatility, low pollution, and low cost liquid fuel adapted for different types of combustion systems, as described in Claim 6, of which said heavy oil can be replaced by grade A heavy oil. When used in a high-speed diesel engine, the ratio of said heavy oil can be adjusted up to 90%.

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LIQUID FUEL ADAPTED FOR DIFFERENT COMBUSTION SYSTEMS

FIELD OF THE INVENTION

The present invention pertains to fuel, particularly a type of high caloric value, high volatility, low pollution, and low cost liquid fuel adapted for different types of combustion systems.

BACKGROUND OF THE INVENTION

Most industrial-use combustion systems use heavy oil for fuel. It is both cheap and safe to store. However, the boiling point of heavy oil is too high, making it difficult to oxidized. For example, the boiling point of grade A heavy oil is 338°C. Grades B and C are even higher at 480°C. Even though heavy oil burners include high pressure injection and reverse types to increase nebulization and gasification, because heavy

oil is not volatile and has high viscosity, oxidation will not be fully complete because nebulized particles are too large and are unable to be completely burned. Not only has part of the calorific values been lost, heavy smoke will be generated because of an incomplete burn. This smoke severely pollutes the environment.

Raw pentane is the primary waste in refined oil products. It is generally led to a tower and burned off. However, raw pentane can dissolve heavy oil. It has high volatility, superfine distribution, superfine nebulization and oxidization. Its boiling point is 25 - 60°C. At room temperature, a high pressure steel cylinder is not needed for storage. Its low octane number (high cetane number), high volatility alkane partially or complexly replaces raw pentane. This class of alkane substance can not be added to gas due to its low octane number; uses for it are few, so it is low cost to purchase. Its low octane number is a high cetane number (n-hexane octane number) of 25, n-heptane octane number of 0, and n-octane octane number of -19. Kerosene has an octane number of 25-35 and cetane number of 47. Use of these alkanes can mixed to form high-, medium-, and low-cetane number fuels for use in high-, medium-, and low-speed diesel engines, respectively.

SUMMARY OF THE INVENTION

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The present inventor examined these two aforementioned points and thoroughly researched dissolving heavy oil in an appropriate amount of raw pentane. After several experiments, ideal formulas of liquid fuel were developed for use in all types of combustion systems (including burners and diesel engines). This fuel developed purely for an effective

high caloric value and minimized pollution. In addition, since the waste product is used, the cost of such fuel decreases.

The present invention primarily provides a type of high caloric value, high volatility, low pollution, and low cost liquid fuel adapted for different types of combustion systems, of which various mixtures are applied to various combustion systems.

Another purpose of the present invention is through various formulations, said liquid fuel can be applied to high-, medium-, and low-speed diesel engines to replace diesel fuel and utilize waste to conserve resources.

METHOD OF THE CURRENT INVENTION

Based on the technical solution presented in the present invention, in general, raw pentane is a solvent whereas heavy oil is dissolved in it to form a solution. Comparing said solution to heavy oil, because the volatility of heavy oil dissolved in raw pentane is clearly greater, the viscosity will likewise be clearly less. This causes the fuel to easily disperse and evaporate with superfine nebulization and gasification for superfine detailed mist particles for a complete burn. Additionally, increasing caloric values also decreases pollution.

The proportion range of the two components of the said liquid fuel provided by the present invention is as follows:

Raw pentane	90-10%
Heavy oil	10-90%

Of which, various proportional mixes are adapted to various types of burners:

	Raw Pentane	Heavy Oil
Gasification burner	80%	20%
Oil hydraulic injection burner	50%	50%
Reverse burner	30%	70%

Raw pentane can be used in such applications as the single solvent. Said raw pentane can also be partially or entirely replaced by a low cost, low octane number, and high volatility alkane with a boiling point between 60°C and 150°C, such as n-hexane, n-heptane, n-octane, and n-nonane. Because these alkanes have a low octane number, they can't be mixed with gas. Hence, they don't have many uses and cost will be low. Because the lower the octane number, the higher the cetane number, it can be adapted with the aforementioned low octane number, high cetane number alkanes exist in the liquid fuel of the present invention. The lower its octane number the higher its cetane number, such as the octane number of n-hexane is 25, the octane number of n-heptane is 0, and the octane number of n-octane is -19. If its octane number is low, the opposite is true and the higher the cetane number, such as kerosene, with an octane number of 25-35 and cetane number of 47. The liquid fuel can be adapted for use with diesel engines to replace diesel fuel while attaining a high caloric value, low pollution, and low cost.

The aforementioned methods of adapting fuel as an inexpensive diesel engine fuel is one example. Its proportion can be adjusted for adaptation for diesel engines of various speeds. The optimal formulas for use of

the liquid fuel of the present invention for high-, medium-, and low-speed diesel engines are as follows:

(1) Adapting the fuel of the present invention to a high speed (2000 RPM or higher) diesel engine:

n-hexane	10%
n-heptane	20%
n-octane	60%
heavy oil	10%

Testing has shown that the cetane number of fuel of the said formula is 45-50, ideal for use in high speed diesel engines.

(2) Adapting the fuel of the present invention to a medium speed (800-1500 RPM) diesel engine:

Raw pentane	10%
n-hexane	10%
n-heptane	20%
n-octane	40%
heavy oil	25%

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The cetane number of this fuel is 35-45.

(3) Adapting the fuel of the present invention to a medium speed (400 RPM or lower) diesel engine:

Raw pentane	20%
n-hexane	10%
n-heptane	10%
n-octane	20%
heavy oil	40%

The cetane number of fuel of the said formula is lower than 35; ideal for use in low speed diesel engines.

The heavy oil used in the aforementioned formulas can be grade A oil to replace high-end diesel fuel. When used in a high speed diesel engine, its heavy oil proportion can be adjusted up to 90%.

The parameters and formulas provided by the present invention are basic data for preferred embodiments. There can be a 3 - 5% variation in the acquired data. In general, the raw materials involve raw pentane; heavy oil; low cost and a low octane number (high cetane number) and high volatility (with a boiling point of 60-150°C) to form the liquid fuel. n-hexane, n-heptane, n-octane, and n-nonane high cetane number alkanes can be added to the raw pentane and heavy oil in a basic formula to form a formula that can replace diesel fuel, for using said liquid fuel in at diesel engine. Regardless of the formula or mixture, all variations are covered within the scope of the present invention.

ABSTRACT

A liquid fuel reforming and blending method, whereby after heavy oils are dissolved in alkanes, the blending method is utilized to form a fuel applicable for usage in diesel oil combustion systems and slow-speed diesel engine systems. Wherein the alkanes employed are polyaromatic alkanes (C9~C20) acquired from reforming oil from bottom of a gasoline tower or reforming oil from bottom of an aromatics extractive tower. The alkanes and the heavy oils are blended in percentage proportions by weight ranging from 10% to 90%, which thereby achieves a flash point temperature of above 45°C. Thus, by means of the reforming and blending method, after blending the heavy oils and the alkanes, a new type heavy fuel oil is converted therefrom, thereby increasing economical value of the heavy oils.

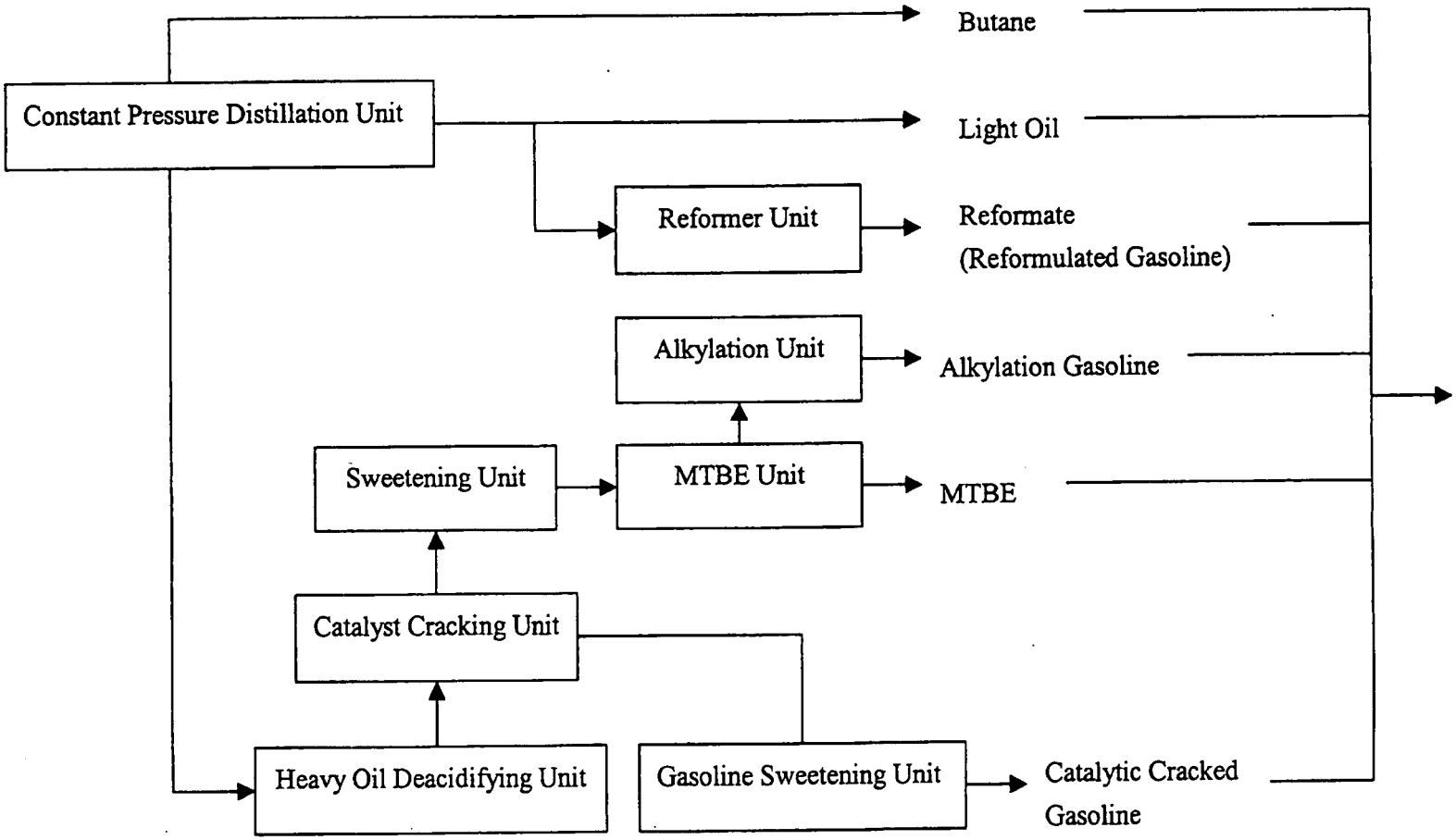
Butane
Constant Pressure Distillation Unit
Light Oil
Reformer Unit
Reformate
(Reformulated Gasoline)
Alkylation Unit
Alkylation Gasoline
Sweetening Unit
MTBE Unit
MTBE
Catalyst Cracking Unit
Heavy Oil Deacidifying Unit
Gasoline Sweetening Unit
Catalytic Cracked
Gasoline

FIG. 1